

THE IMPLEMENTATION OF CURRICULUM 2013 IN THE TEACHING OF MATHEMATICS AND ITS EFFECT TO STUDENTS' MASTERY OF ESSENTIAL MATHEMATICS CONCEPT IN SENIOR HIGH SCHOOL

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Abstract

This study was designed to diagnose students' mastery level and difficulties in essential concepts of mathematics, and also reveal the difficulties of the teachers in teaching these concepts in the implementation of Curriculum 2013. The approach used to diagnose this case was the Socratic approach, the approach adopted from how Socrates taught his students. The materials diagnosed include the materials of the first semester of class X of science. The research subjects consisted of 321 students and 33 high school teachers. The results showed that the students' mastery of essential math concepts are still at the low level, there are still many difficulties encountered by students and teachers

Keywords: essential concepts of math, Socrates, 2013 Curriculum

INTRODUCTION

As a science that has structured concept studying the patterns of regularity, of organized structures, mathematical concepts are presented from the simplest concepts to the most complex. Mastery of a topic is the basis and prerequisite for understanding other concepts. Likewise, school mathematics, the topics in school mathematics has been sorted out and adjusted such with the stage of intellectual development of students and is expected to stimulate the development of students' thinking skills. Ebbutt and Straker (Depdiknas, 2006) suggests the nature and characteristics of school mathematics as: (1) The search patterns and relationships, its implications in learning gives students the chance to conduct discovery and investigation to determine the patterns of relationships; (2) activities that provide opportunities for students to experiment with different ways so as to explore the creativity that requires imagination and intuition. The implications of this in the learning activities include encouraging student initiative and provides the opportunity for students to think differently; (3) problem-solving activities, the implications of such learning encourages students to think logically, consistently, systematically and develop system of documentation.

School mathematical properties of the material are still elementary but it refers to essential concepts as the basis for mastery of prerequisite concepts of higher mathematics. This is consistent with the nature of mathematics as a structured science in which according to MKPBM Team (2001: 25), in mathematics there is a topic or concept as the basic prerequisite for understanding further topic or concept. Like building a multi-storey building, the second floor and the next will not be achieved if the foundation and the earlier floor as prerequisite has not been arranged.

2013 curriculum has been implemented in some schools since the school year 2013/2014. There are some changes in the curriculum as an improvement of the previously imposed curriculum, one of them is the use of scientific approach to all subjects taught. For the problems in this study is formulated as follows:

1. How is the students' mastery of essential concepts of math?
2. What difficulties experienced by students in the learning of mathematics in the implementation of 2013 curriculum?
3. What difficulties experienced by teachers in the teaching of mathematics in the implementation of 2013 curriculum?

So based on the above problems, the purpose of the study is to describe students' mastery and as well as teachers' difficulties in learning essential concepts of math. What is meant by mastery of essential concepts in this study is the mastery of basic concepts and their application.

To determine the students' mastery of essential concepts of math, the writer tried to identify it by using math diagnostic test that covering the material of semester I science class X. Then the writer traced the students' difficulties using the Socrates approach. This approach adopts the way Socrates taught his students where Socrates taught not by way of explaining, but by asking questions to show the logical error of the answer, as well as to inquire further, so that the students are trained to be able to clarify their own ideas and can define the concepts they mean in detail. Through this approach students are invited to get involved in asking and answering activity to guide and deepen the level of understanding of the basic concepts related to the mastery of math basic concept, so they get their own thoughts on the results of cognitive conflict which are resolved (Johnson & Johnson, 2002).

Thus the study is expected to provide input to the public and stakeholders on the implementation of the 2013 curriculum in the teaching and learning of mathematics so that weaknesses can be corrected so that the perceived difficulties of teachers and students can be solved immediately.

RESEARCH METHOD

This study is a combination of descriptive and causal comparative research that aims to diagnose and describe mastery as well as the difficulties of high school students to the essential concepts of mathematics, and also reveal the difficulties of teachers in teaching these concepts. Research subjects consisted of 321 high school students and 33 high school teachers in several districts in West Java. To determine student mastery of essential math concepts, students were given diagnostic tests mastery of basic math and its application in the first semester material of science class X which includes: Exponents and Logarithms, Linear Equations and Inequalities, Systems of Linear Equations and Inequalities, Matrices, relations and functions, sequence and series. After the diagnostic tests, the writer used the questioning technique with Socrates approach to determine the difficulties of the students and teachers in the learning process which is carried out as well as a discussion with teachers to discuss efforts that should be made to resolve it. To analyze the data obtained, the descriptive statistic was used, so as to provide a clear picture of the phenomenon that is happening.

Socrates approach used to diagnose the difficulties of students and teachers is adopted from Socrates' way to educate students. Socrates educates students by asking questions and tracing the answers through asking and asking again to find detailed point of the answer. When the questions continue to flow with the answers then there will be an attempt to explore, examine so that the brain will work constructively maximum. Very detailed knowledge comes up and traces by itself. In this case, Socrates found the final answer, there was no ability to answer further.

Socrates method of teaching is very unique. If other philosophers teach by patronizing or lecturing, Socrates used his own way that is by constantly asking which is then rounded into a sense. The way in which Socrates administered is the method of induction and definition. Induction and definition are inter-related. Induction becomes the basic of definition. Induction which becomes Socrates' method is to compare critically. He did not try to reach understanding

with examples and equations, and not also test it with the witness and opposing witnesses. Understanding gained through the Socrates' method is tested on several real circumstances or events. If the concept has not been adequately conveyed by their students, then the improvement of the definition is carried out so that a more perfect concept is achieved. In the Socrates teaching method also there is a phase showing logical error of the answer, as well as by asking further, so that students are trained to clarify their own ideas and define the concept that they mean in detail (Team, 2008).

According to Tim (2008) Socrates teaching method has significant influence with the establishment of: 1) The theory of constructivism, namely: learning processes that explain how knowledge is structured in the learners (student must be active in the teaching and learning process). Constructivist teaching model here refers to an interactive teaching model and teaching model centered on the issue; 2) cognitivism learning theory in the form of understanding and behavioral change that can be observed. Both of these learning theories develop further dialogic educational practices exemplified by Socrates. Learning is the core concept along with a shared experience, dialogue, and reflection

RESULT AND DISCUSSION

1. Results of Diagnostic Tests

From the results of the written diagnostic tests performed on 321 high school student obtained the following data:

Table 1
The Test result of essential concept of Math Mastery for each main topic

NO	Basic Competence	Passed Students (%)	Failed students (%)
1	Exponents and Logarithms	36.88	63.12
2	Linear Equations and Inequalities	49.46	50.54
3	Systems of Linear Equations and Inequalities	46.85	53.15
4	Relations and Functions	47.51	52.49
5	Matrix	43.38	56.62
6	Sequences and series	39.26	60.74
	Average	43.89	56.11

Graduation criteria for the diagnostic test tailored to the average minimum criteria of accomplishment for high school mathematics subject in Indonesia, of which the subject of research is to achieve 75% and above. This result is quite surprising, because more students who do not pass the entry category compared with those in the category of passed. From these data it is also known that the lowest graduation is on material Exponents and logarithms.

Table 2
The Test Result of essential concept of math mastery for each aspect

No	The Aspect of essential concept of Math Mastery	\bar{x}	s	Passed Students (%)	Failed students (%)
1	Basic concept mastery (SMI =60)	35,11	9,43	44,24	55,76
2	Concept application mastery (SMI=40)	22,26	7,55	42,37	57,63
3	Overall (SMI=100)	57,37	16,92	43,92	56,08

Based on the search using the Socrates' questioning techniques, the low graduation of students was due to the students' mastery of basic math concepts which are still weak in elementary and junior high material required for mastery of math in high school. Ruseffendi (Tim MKPBM, 2001:25) states that math studies the patterns of regularity, of the organized structure. It starts from the elements that are not defined then on the elements defined to axioms/postulates and finally on theorems. Mathematical concepts hierarchically structured, structured, logical, and systematic, ranging from the simplest to the most complex concepts. In mathematics there is a topic or concept as the basic prerequisite for the understanding of the topic or concept.

2. Students' Difficulties

Many factors affect students' difficulties in mastering essential concepts of math. Broadly speaking, the factors are internal factors of the student's own self as well as external factors of how teachers teach and infrastructure that supports the teaching and learning process. Based on questioning-answering using the Socrates approach, these difficulties are:

- a. In the textbooks issued by the central government A further review found that there are tests items whose difficulty level is too high such as those for math Olympiad that most students would make it difficult to finish. Besides, many students struggle to accomplish the test items connected with another subject because the difficulty level is also quite high.
- b. Large number of the content of Basic Competency (KD) in class X in 2013 compared with School based curriculum is quite burdensome to students, which is exacerbated by a lack of mastery of prerequisite material obtained by students in elementary and junior high school.
- c. Characteristics of learning that requires students to figure out and be creative to make learning more focused on the discovery of the concept and it is less for applications of the concept perceived as relatively in short time.
- d. Specialization of interest in science and social studies conducted since the class X without tracking students' interests and abilities make some students feel are not in accordance with the specialization chosen so that then causes a low learning motivation.
- e. Differentiating between compulsory mathematics and specialization mathematics, there is enough attraction for the students, because in compulsory mathematics, the students are required to learn started from the basic concepts, whereas in specialization mathematics is concerned with the application so that in the specialization mathematics, students have enough trouble.
- f. The students are still less able to distinguish the learning process which is based on 2013 curriculum with the previous curriculum in elementary and junior high. They do not feel that there is a significant difference of learning so that they did not know what to do to follow the dynamics that are required in the 2013 curriculum.

From the above description it can be summarized that the difficulties of students generally due to the high difficulty of test items in textbooks, interest specialization which is too early, lack of mastery of prerequisite material, and due to the lack of socialization of 2013 curriculum to students. The weak mastery of the basic concepts causes the weak ability to apply these concepts to solve problems in everyday life and on other subjects. Wahyudin (1999: 22) says that one of the causes of students' weaknesses in mathematics is less ability to understand and recognize the concepts of basic mathematical (axiomatic, definitions, rules and theorems) relating to the subject being discussed.

To further optimize the students' understanding of essential concepts of math can be approximated by using the experience of the student or concrete objects that exist in everyday life. Bourne (Romberg, 1992: 752) states that to understand mathematics as social

constructivism, the emphasis is on *knowing how*, where students are viewed as active beings who construct knowledge by interacting with the environment. It is different from the definition *knowing* adopted by the absolutis, where the learner is seen as being passive and can be filled arbitrarily with information of actions to goals.

3. Teacher's Difficulties

Because there are two actors in the learning that interact each other, namely students and teachers, then once we know the mastery and the difficulties of students in the mastery of essential math concepts, to obtain impartial information, the technique of Socratic questioning approach administered to the teachers. So that the perceived difficulties of teachers are obtained as follows:

- a. Lack of intensive training and socialization before 2013 curriculum is implemented led to a lot of teachers who do not understand the distinction between this curriculum with the previous curriculum in terms of planning, implementation and evaluation of the instruction.
- b. Many teachers feel difficult to apply the scientific approach to a certain math material specified in 2013 curriculum, so sometimes the process of teaching and learning is combined with the usual expository method as given by the teacher and the invention is not performed since the understanding of the concept, but only at the time of application of the concept.
- c. Implementation of 2013 curriculum was imposed, in fact, technically in the field, schools or teachers seemed not ready and there should be synchronization between the junior and senior high school.
- d. The high degree of test items difficulty existing in textbooks makes some teachers also have difficulty in accomplishing such problems.
- e. At the time of evaluation which uses authentic assessment, the teachers with the number of students in a large class are inconvenience in assessing the attitudes and spiritual aspects.

Based on the explanation above, the difficulty lies in the teachers' understanding of the curriculum, the application of learning approaches, the high level difficulty of the test items in the text book, almost identical to the difficulties experienced by students. For that reason, in order that learning works effectively so that the students' understanding is chronological, detailed and in-depth, teacher can use a reflection mechanism and flicked so that students can remember and combine the full knowledge of the various elements. Reflection mechanism in the form of dialogue is used by itself to establish an atmosphere of living knowledge. This process in terms of Paulo Freire, figures of contemporary education is a participatory educational or 'andragogy' teaching methods, the knowledge that involves the learner as subject actively (Rambangeng, 2013).

The way teachers flicked through intense dialogue process, by itself stimulates a very sharp dialogue between the questioner and the responder. Both became pupil and teacher, both learned and basically find the main answers of the topic in question. Not only was the focus of the discussion because he continued to have the answers and questions, the theme will focus, do not jump up and down in discussions. Teachers must teach their students how to think critically in a democracy (Rambangeng, 2013).

CONCLUSION AND SUGGESTION

From the data analysis it can be concluded that:

1. The students' mastery of essential concepts of math are still in low level, it is seen from the average percentage of unsuccessful students in a diagnostic test that is greater than the passed and the pass rate which is less than 60%.
2. The difficulties of students in mastering essential concepts of math is caused by several factors, namely because of the high difficulty of test items in the text book, interest specialization is too early, lack of mastery of prerequisite material, and due to the lack of socialization of 2013 curriculum to students.
3. Teachers' difficulty in teaching the essential concepts lies in the lack of understanding of 2013 curriculum, teachers' disability on the application of learning approaches, and also the high level of test items difficulty.

For it is recommended:

1. Socialization, training and guidance to teachers on 2013 curriculum is conducted periodically sustainable and equipped with appropriate modules.
2. There should be a clear elaboration of material of each basic competency equipped with books corresponding to the content on 2013 curriculum, as well as the level of ability that will be developed in each basic competency is made clearer.
3. The order of the material in the textbook of mathematics should really pay attention to the nature of mathematics as structured knowledge and synchronized with the material of other subjects that require knowledge of mathematics as supportive matters such as physics, chemistry, and so on.
4. The materials and the questions in the textbook should be reviewed and adjusted to the level of students' thinking in the classroom.
5. 2013 curriculum should also be socialized to learners, so they can understand what purpose and system are used in the new curriculum.

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